SECTION 02581

PAVEMENT MARKINGS (EDWARDS AFB) PAINT, WATERBORNE TRAFFIC LINE WHITE, YELLOW AND BLACK
10/99

PART 1 GENERAL

1.1 SPECIFICATIONS AND STANDARDS

The following Specifications, Test Methods, and Standards in effect on the opening date of the [Invitation for Bid][Request for Proposals] form a part of this Specification where referenced.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D75	(1997) Standard Practice for Sampling Aggregates
ASTM D93	(1999) Standard Test Methods for Flash-point by Pensky-Martens Clsoed Cup Tester
ASTM D522	(1993a) Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings
ASTM D562	(1997 E) Standard Test Method for Consistency of Paints Using the Stormer Viscometer
ASTM D711	(1998) Standard Test Method for No-Pick-Up Time of Traffic Paint
ASTM D713	(1998) Standard Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials
ASTM D1210	(1996) Standard Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage
ASTM D1475	(1998) Standard Test Method for Density of Liquid Coatings, Inks, and Related Products
ASTM D1640	(1995) Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature
ASTM D2369	(1998) Standard Test Method for Volatile Content of Coatings
ASTM D2486	(1996) Standard Test Methods for Scrub Resistance of Wall Paints
ASTM D3186	(1995) Standard Test Methods for Rubber Evaluation of SBR (Styrene-Butadiene Mixed With Carbon Black or Carbon Black and Oil

ASTM D3335	(1999) Standard Test Method for Low Concentrations of Lead, Cadmium, and Cobalt in Paint by Atomic Absorbtion Spectroscopy
ASTM D3718	1999) Standard Test Methods for Low Concentrations of Chromium in Paint by AtomAbsorption Spectroscopy
ASTM D3723	(1999) Standard Test Method for Pigment Content of Water Emulsion Paints by Low Temperature Ashing
ASTM D3960	(1998) Standard Practice for Determining Volatile Organic Comound (VOC) Content of Paints and Related Coatings
ASTM D5380	(1998) Standard Test Method for Identification of Crystalline Pigments and Extenders in Paint by X-Ray Diffraction Analysis
ASTM E70	(1997) Standard Test Method for PH of Aqueous Solutions with the Glass Electrode
ASTM G53	(1996) Standard Test Method for Operating Light and Water Exposure Apparatus (Fluorescent UV-Condensation Type)

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION (CDT)

SPECIFICATION	(1995) Standards

CODE OF FEDERAL REGULATIONS (CFR)

TITLE 49	(1995)Specifications

FEDERAL SPECIFICAITONS (FS)

595b	(1995) FED-STD-595B, Colors

1.2 SCOPE

This Specification is intended to cover ready-mixed one component waterborn traffic line paint to be applied to either asphaltic or portland cement concrete pavements.

1.3 NOTES

1.3.1 Certification of Compliance

The manufacturer shall furnish a Certificate of Compliance with each batch of paint, in accordance with the provisions of Section 6-1.07 of the Standard Specification.

1.4 QUALIFIED PRODUCTS LIST (QPL)

1.4.1 Paint Samples

All paint samples submitted will be inspected for compliance with this specification. Paint complying to this specification will be listed on the State of California Qualified Products List for: Paint, Waterborne Traffic Line, White, Yellow and Black. Qualification of a paint does not relieve the manufacturer of his obligation to maintain such quality control assuring that subsequent deliveries of his product will comply with this specification and be identical to sample(s) evaluated. When changes in manufacture are made in products appearing on the Qualified Products List, it is the responsibility of the supplier to immediately notify the Department of Transportation of such changes. Deliveries of the new product shall not be made until the product has been submitted to the Department of Transportation, evaluated and qualified.

1.4.2 Qualification Testing and Evaluation

Qualification testing and evaluation is performed by the Transportation Laboratory. Venders seeking qualification must submit samples of the paint and the following information to the Transportation Laboratory, Chemistry Section, 5900 Folsom Blvd., Sacramento, CA 95819-0128.

Material Safety Data Sheets.

Test results from a qualified testing laboratory for the batches of paint submitted for qualification.

Legal certificate that states the bid samples represent the designated batch of paint.

A Quality Control plan for the manufacture, testing and shipment of water borne traffic paint. The plan shall detail how the manufacturer will remain within the allowable variances of the selected paint properties. Testing shall be performed by a qualified testing laboratory. The descriptions of the qualified testing laboratory shall include but not be limited to; a description of the lab test equipment, calibration procedures, familiarity with the test methods and qualifications of lab personnel to perform the testing.

Paint submitted must meet all the requirements of this specification. Venders must qualify for white, yellow and black paints, no partial qualification will be allowed.

A minimum of 15 liters (15 quarts) 15 quarts each of white and yellow, and 4 liters (4 quarts) 4 quarts of black are required. If the clean-up and flushing solvent is other than water, the recommended solvent shall be printed on the label. All shipping and transportation charges shall be prepaid by the vendor.

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

QUALIFIED PRODUCTS LIST (QPL) FOR SPECIFICATION #8010-20B
Paint, Waterborne Traffic Line, White, Yellow and Black

Manufacturer	Manufacturer's Product Code	Color

Pervo Paint Company	6000	White
	6003	Yellow
	6002	Black
	6052	Black
Morton Traffic Markings	28-48-1	White
	28-52-2	Yellow
	2677A7	Black
Ennis Paint Company	EP-CA-301	White
	EP-CA-302	Yellow
	EP-CA-303	Black

PART 2 PRODUCTS

2.1 REQUIREMENTS

2.1.1 General

This Specification is intended to specify paint that will meet service requirements for highway construction and maintenance.

2.1.1.1 Pre-Bid Qualifications

The Department of Transportation maintains a Qualified Products List (QPL) for Waterborne Traffic Line paint. Only those brands and product numbers listed on the QPL will be accepted for State of California purchase and use. Requirements for prequalification, and products currently qualified, are listed in section 1.4.2.

2.2 COMPOSITION

The composition of the paint shall be determined by the manufacturer. However, the paint shall not be manufactured using lead or chromium pigments. It will be the manufacturer's responsibility to produce a pigmented water borne paint containing the necessary co-solvents, dispersants, wetting agents, preservatives and all other additives, so that the paint will retain its viscosity, stability and all other properties as specified herein. No glass beads or sand shall be permitted in the paint formulation.

2.3 CHARACTERISTICES OF THE FINISHED PAINT

2.3.1 Condition in the Container

The paint, as received, shall show no evidence of biological growth, corrosion of the container, livering or hard settling. The paint shall be returned to a smooth and homogeneous consistency, which is exempt of gel structures, persistent foam or air bubbles, by had mixing.

	White	Yellow	Black
A) Consistency, K.U. at 25±1 C ASTM D562	75-90	75-90	75-90
B) Fineness of Dispersion, Hegman, minimum, ASTM D1210	3.0	3.0	3.0
C) No-Pick Up Time, without beads,	10	10	10

minutes, maximum, ASTM D711

D) Dry through, minutes, maximum	20	20	20

This test may be performed on the same draw down sample as in section 3.3.4. The test is the same as outlined in ASTM D1640 except that the lightest thumb pressure possible should be used. The thumb is turned through an angle of 90 degrees while lightly in contact with the film. The drying time at which this rotation does not break the film is recorded.

	White	Yellow	Black
E) Dry Through, 90% Relative Humidity, minutes, maximum	180	180	

Draw down the paint on a glass panel to a wet film thickness of 330 mm () Immediately place the panel in a humidity chamber maintained at 23±2 C and 90±5% relative humidity. Test in accordance with ASTM D1640 except that the pressure exerted shall be the minimum needed to maintain contact between the thumb and the film. Check the film for a dry through condition at 15 minute intervals.

	White	Yellow	Black
F) Volatile Organic Compounds (VOC), grams per liter of paint, excluding water, maximum.	150	150	150

Use ASTM D3960 or other approved method in effect at the time of paint manufacture to determine the VOC level and water content of the paint.

	White	Yellow	Black
G) Flashpoint, ASTM D93 Method A, minimum, C	38	38	38

	White	Yellow	Black
H) Flexibility, ASTM D522 Method B	Pass	Pass	Pass

Use 100 x 150 mm tin-plated steel panels 250 mm thick. Prepare the panel by lightly buffing one side with Grade 0 (medium-fine) steel wool, followed by cleaning with toluene and drying. Draw down the paint on the buffed side of the panel to a wet film thickness of 130 mm. Air dry the panel for 24 hours at standard conditions, then bake for 5 hours at 105±2 C and finally condition the panel for 30 minutes at standard conditions. Bend 180 over a 13 mm mandrel and examine under a magnification of 10 diameters. The paint film shall not crack, chip or flake when the panel is bent around the mandrel.

	White	Yellow	Black
I) Appearance	Pass	Pass	Pass

Draw down a 330 mm thick wet film of the paint on a glass plate and allow to dry for 24 hours at standard conditions. The paint shall produce a film which is smooth, uniform, free from; grit, undispersed particles. Craters, pinholes and cracking.

	White	Yellow	Black
J) Dry Opacity, minimum	0.90	0.85	1.0

On a black-white Leneta chart, Form 2C-Opacity, draw down a 130 mm thick wet film of paint covering both the black and white portions of the chart. Dry for 24 hours at standard conditions. Use a Photovolt Reflection Meter,

Model 670 or equivalent, with Model 610 T Search Unit provided with Tristimulus filters; green, blue and amber. Calibrate according to the manufacturer's instructions and measure the reflectance over the white and black portions with the green filter. Dry Opacity is calculated as:

$$\frac{\text{Reflectance over black}}{\text{Reflectance over white}} = \text{Dry Opacity}$$

	White	Yellow	Black
K) Yellowness Index, maximum	8	-	-

Draw down a 330 mm thick wet film on two 75 x 150 mm chromate treated aluminum panels. Dry for 24 hours at standard conditions. Save one panel for the Accelerated Weathering test (section 2.3.1 O)). Using a Reflection Meter, measure the reflectance of the white paint film using the green, blue and amber tristimulus filters. Follow the manufacturer's instructions to recalibrate the Reflection Meter as the filters are changed. Calculate the Yellowness Index as follows:

$$\text{Yellowness Index} = \frac{\text{Amber - Blue}}{\text{Green}} \times 100$$

	White	Yellow	Black
L) Daylight Luminous Reflectance	86 min.	50-60	-

With the same draw down as in section 2.3.1 K) above, measure the reflectance of the white and yellow paint films using the Reflection Meter and the green tristimulus filter.

M) Yellow Color

Draw down the yellow paint on two chromate treated aluminum panels as described in section 2.3.1 K). One panel should be used for the Accelerated Weathering test section 2.3.1 O). Retain the other yellow panel as a control and for the Reflectance test (section 2.3.1 L)). The yellow color shall match 595b, color #33538 and shall lie within the chromaticity coordinate limits as defined below when tested according to California Test Method No. 660 and plotted on a C.I.E. (1931) chromaticity Diagram. The yellow color shall lie within these chromaticity coordinate limits both before and after the Accelerated Weathering test.

Measurement conditions: 2 /Illuminant "C"
Hue: 580 to 583.5 nm
Minimum color saturation: x=0.7000-0.5000y
Brightness: Y=50 to 60

N) Black Color

Draw down the black paint on a chromate treated aluminum panel as described in section 2.3.1 K). After drying for 24 hours at standard conditions the color shall closely match 595b, color #37038.

O) Accelerated Weathering Test
Ultraviolet Light and Condensate Exposure, ASTM G53. 300 hours total.

Prepare samples of the white and yellow paints as described in section Alternately expose the samples to four hours of UV exposure at 60 C, followed by four hours condensate exposure at 40 C. Type FS-40 (UV-B) bulbs are used at an irradiance level of 0.47 watts per square meter at 310 mm, as measured a the sample surface during the UV cycle. After 300 hours

total exposure the paint samples shall meet the requirements below. Retain these samples for the Scrub Resistance test (see section 2.3.1 P)).

White - Yellowness Index, maximum, 12 (see section 2.3.1 K))
Yellow - Must pass Yellow Color test (see section 2.3.1 M))

	White	Yellow	Black
P) Scrub Resistance, cycles, minimum	500	500	-

Follow the procedure in ASTM D2486 modified to use the exposed 75 x 150 mm panels from the Accelerated Weathering test (section 2.3.1 O)). Tape the aluminum sample panel to the scrub machine with its 75 mm length parallel to the axis of scrubbing and laying in the path of the oscillating scrub brush. No shim should be used. The paint shall not wear through on any part of the paint film in less than 500 cycles.

	White	Yellow	Black
Q) Roadway Service Durability Rating, minimum ASTM D713, after 180 days exposure	6	6	-

Test stripes shall be applied transversely across the pavement in accordance with ASTM D713. Paints shall be applied and tested on both portland cement concrete and asphalt concrete pavements.

Dry paint film thickness of the test stripes shall be between 130 and 200 mm as determined from test panels taken during application. Current State Specification glass beads (moisture-proof type) shall be applied immediately after the paint and during the same striping operation. The paint film shall accept the glass beads so that the spheres are embedded into the film to a depth of 60% of their diameter. Test stripes will be observed for a period of 180 days from the date of application.

After 180 days of service, the durability of the test stripes will be rated from 0 to 10 in accordance with ASTM D713. Only those test stripes with a rating of 6 or better will be accepted. Glass beads shall have good retention to the test line. This is determined by close-up examination of the test line.

This Roadway Service Durability Rating may be waived at the option of the Engineer or evaluated for a period of less than 180 days.

	White	Yellow	Black
R) Lead, mg/kg in dried paint, maximum, ASTM D3335	100	100	100

	White	Yellow	Black
S) Chromium, mg/kg in dried paint, maximum, ASTM D3718	50	50	50

	White	Yellow	Black
T) Thick Application Cracking Resistance	Pass	Pass	Pass

On a black-white Leneta chart, Form 2C-Opacity, draw down a stripe of the paint 75 mm wide and at least 150 mm long and having a 1530 ±130 mm wet film thickness. Allow the paint to dry for 48 hrs. at standard conditions on a horizontal surface. After 48 hrs. the paint film shall not contain any cracks.

	White	Yellow	Black

U) Accelerated Package Stability	Pass	Pass	Pass

All a clean 500 mL (1 pint) resin-lined friction-top paint can with a well stirred sample. Immediately close the can tightly. Store this can at a temperature of 52 C for 14 days. Allow the can to cool overnight. Determine the Consistency of the paint as in section 2.2, except allow hand stirring for 5 minutes to ensure uniform redistribution of any settlement. The consistency of the paint shall not change more than 5 K.U. after this heated storage period. Draw down a 330 mm thick wet film of this sample on a glass plate and examine for Appearance as in 2.3.1 I).

2.4 ALLOWABLE VARIATIONS

The following properties will be measured at the time of qualification and again during the delivery of production lots. The composition and properties of the paint must remain within the allowable variations as indicated. If any property falls outside the variances, the batch will be rejected and replaced at the manufacturer's expense.

	White	Yellow	Black
A) Density, g/ml, at 25 C, ASTM D1475 allowable variation from qualifying sample	±0.04	±0.04	±0,04

	White	Yellow	Black
B) Pigment, Weight %, ASTM D3723, allowable variation from qualifying sample	±2.0	±2.0	±2.0

	White	Yellow	Black
C) Nonvolatile Content, Weight %, ASTM D2369 allowable variation from qualifying sample	±2.0	±2.0	±2.0

	White	Yellow	Black
D) Infrared Spectra of Nonvolatile Vehicle ASTM D3186 allowable variation from qualifying sample	None	None	None

	White	Yellow	Black
E) X-Ray Diffraction Scan of Pigments ASTM D5380 allowable variation from qualifying sample	None	None	None

	White	Yellow	Black
F) pH, ASTM E70 allowable variation from qualifying sample	±1.0	±1.0	±1.0

2.5 QUALITY ASSURANCE PROVISIONS

2.5.1 Inspection

Each batch of waterborne traffic paint intended for use by the State of California must be tested by a qualified laboratory and a certified copy of the test results sent to the Transportation laboratory before the material is shipped. See section 1.4.2 for a description of what constitutes a qualified lab. A batch shall be that amount of paint which was manufactured and packaged in a single operation. Information to be included in the test report are: No-Pick Up time, Dry Opacity, Yellowness Index, Reflectance, Consistency, Non-Volatile Weight Percent, Pigment Weight Percent and Density. The first three production batches of each

color shall be tested by the Transportation laboratory, as well as the qualified laboratory, and correlation between laboratories must be satisfactory before shipment occurs.

When the first three batches of each color are accepted, the subsequent batches shall be treated as follows. The manufacturer shall send to the Transportation laboratory a representative 1L (one-quart) sample of each batch of paint fro random testing. Test data from these samples shall prevail over all other tests and will be the basis of rejection. Material not meeting the specification shall be removed and replaced by the manufacturer at his expense, including all costs for handling, retesting and shipping.

On the first Monday following shipment of waterborne traffic paint fro any Department of Transportation contract during the previous week, a list of each shipping location including: name and phone number of contact person, colors, batch numbers and quantity of each paint, shall be faxed to the Transportation Laboratory, Chemical Testing Section, 5900 Folsom Blvd., Sacramento, CA 95819-0128, attn: Lisa Dobeck, (916) 227-7280, Fax (916)227-7168.

2.6 PREPARATION FOR DELIVERY

2.6.1 Packaging

All manufactured paint shall be prepared at the factory ready for application. The finished paint shall be furnished in the container size specified in the purchase order or contract.

When 19 liter containers are specified, they shall be round and have standard full open head and bail. If 208 liter steel drums are specified, they must have removable lids and airtight band fasteners.

When bulk containers are required by the purchase order or contract, the paint shall be delivered in a container (tote) meeting the following requirements.

1. Tank volumes are estimated and so specified in each of three (3) Bulk Container drawings dated 09-04-91. Vendor shall allow a 19 liter headspace for expansion of the paint.

2. Maximum size in regards to width, depth and height shall be in accordance with one of the three drawings dated 90-04-91.

3. Top openings; 46 cm diameter manhole and 15 cm diameter fill cap.

4. Bottom outlet; 5 cm I.D. full flow non-restrictive valve with outlet guard.

5. Outlet to have ‘Ever-Tite' or compatible quick coupler.

6. Fabricated from 304 stainless steel.

7. Capable of being stacked two (2) high when full.

8. Capable of being lifted by crane (lifting eye) and forklift when full.

9. Top of tank shall be equipped with one (1) vacuum relief valve and one (1) pressure relief valve.

10. Top opening and outlet shall provide for easy installation of liner.

11. Proper certification by the California Highway Patrol that the

container complies with all applicable laws, rules, and regulations.

All shipping containers must comply with Code of Federal Regulations, Title 49 and all other applicable Federal and State Regulations governing their use. The containers and lids must lined with a suitable coating so as to prevent attack by the paint or by agents in the airspace above the paint. The lining must not come off the container or lid as skins.

Containers shall be colored white, including lids, and have an identifying band of the appropriate color around and within the top one-third of the container. Stainless steel containers (totes) do not need to be painted white.

All containers shall be properly sealed with suitable gaskets and shall show no evidence of leakage and shall remain in satisfactory condition for a period of 12 months after delivery. The vendor shall be held responsible for replacing containers unfit for use and will be responsible for all costs and transportation charges incurred in replacing paint and containers.

All containers shall be pelletized and banded for shipment.

2.6.2 Marking

All containers of paint shall be labeled showing the State specification number, manufacturer's name, date of manufacture, color and manufacturer's batch number. Containers shall be clearly labeled " Waterborne Traffic Paint".

All containers of the paint shall be labeled to indicate that the contents fully comply with all rules and regulations concerning air pollution control in the State of California.

The manufacturer of the paint shall be responsible for proper shipping labels with reference to whether the contents are; toxic, corrosive, flammable, etc., as outlined in the Code of Federal Regulations, Title 49.

The Contractor shall list on the Demountable Weight Tags the kilograms per liter and pounds per gallon each for the white, yellow and black paints.

PART 3 EXECUTION

3.1 WORKMANSHIP

3.1.1 Foreign Materials

The paint shall be free from foreign materials such as; dirt, sand, fibers or other materials capable of clogging; screens, valves, pumps, or other equipment used in paint striping apparatus.

3.1.2 Pigment

The paint pigment shall be well ground and properly dispersed in the vehicle. The pigment shall not cake or thicken in the container and shall not become granular or curdled. Any settlement of the pigment in the paint shall result in a thoroughly wetted, soft mass which permits the complete and easy vertical penetration of a paddle. Settled pigment shall be easily redispersed, with a minimum of resistance to the sidewise manual motion of the paddle across the bottom of the container. This stirring shall return the paint to a smooth uniform product of the proper consistency. If the paint cannot be easily redispersed, due to excessive pigment settlement or any other cause, then the paint shall be considered unfit for use.

3.1.3 Properties

The paint shall retain all specified properties under normal storage conditions for 8 months after acceptance and delivery. The vendor shall be responsible for all costs and transportation charges incurred in replacing paint that is unfit for use. The characteristics of any replacement paint, as specified in section 2.3, shall remain satisfactory for 8 months from the date of acceptance and delivery.

3.1.4 Air Pollution Controls

The paint shall comply with all air pollution control rules and regulations within the State of California in effect at the time the paint is manufactured.

-- End of Section --